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Herschel-PACS observation of gas lines from the disc around HD141569A

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Herschel-PACS observation of gas lines from the disc around HD141569A



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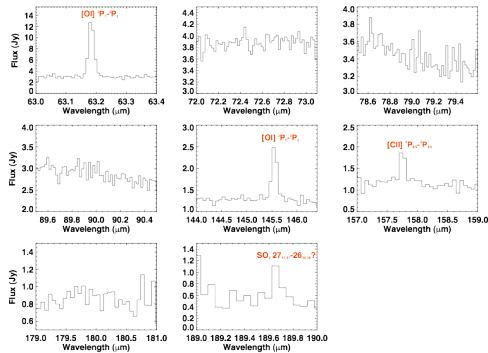
² CEA, Saclay, Fr; ³ UAM, Spain; ⁴ UMI-LFCA, CNRS/INSU, Chile; ⁵ SUPA, University of St-Andrews, UK; ⁶ Kapteyn Astronomical Institute, NL; ⁷ SOFIA-USRA, NASA, USA; ⁸ ALMA, Chile; ⁹ Open University, UK; ¹⁰ RAL, UK; ¹¹ NASA Herschel Center, USA; ¹² Clemson University, USA



Protostars and Protoplanets VI, 15-20 July 2013 Heidelberg

HD 141569A was observed by Herschel as part of the Gas in Protoplanetary Discs Survey (Dent et al. 2013).
We complemented with ground-based observations to constrain the gas and dust in the disc.

Herschel-PACS GASPS programme :
[OI] 63, 145 & [CII] lines detected

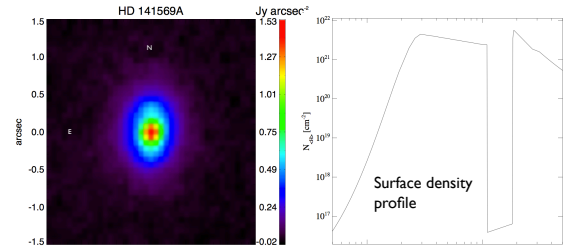


Model parameters

B9.5V star, 5 Myrs, d=108pc
 $M_{\text{dust}}(\text{disc}) \sim 2.6 \times 10^{-6} M_{\text{Sun}}$
 $M_{\text{gas}}(\text{disc}) \sim 2.5 \times 10^{-4} M_{\text{Sun}}$
 $M_{\text{PAH}}(\text{disc}) \sim 1.8 \times 10^{-12} M_{\text{Sun}}$
Inner disc: 5-110 AU
Outer disc: 185-500 AU

Gas mass/Dust mass ~ 100

Density structure
consistent with VISIR image at 8.6 micron



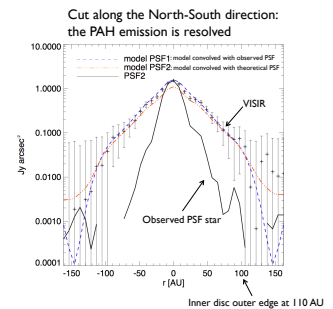
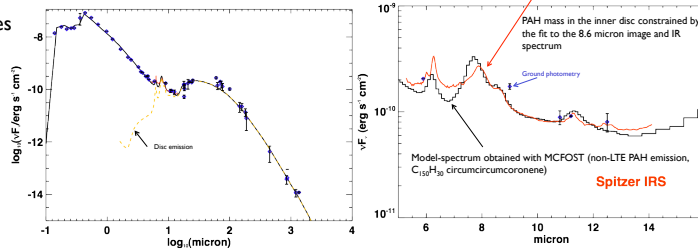
PAH emission at 8.6 micron

Disc continuum modelling with MCFOST

Fit to the SED + PAH features
with MCFOST
(Pinte et al. 2006)

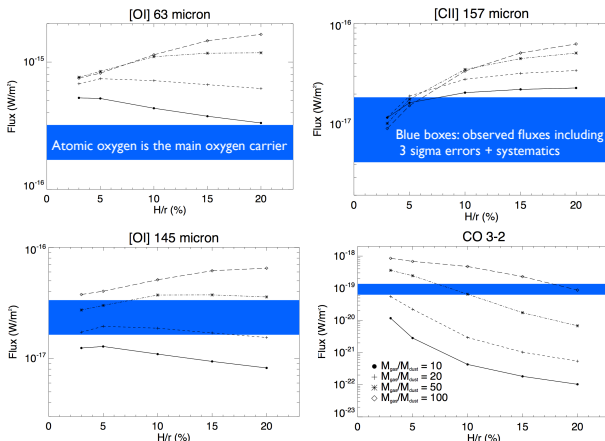
nlte PAH + dust
opacities treated simultaneously

PAH treatment: Draine & Li

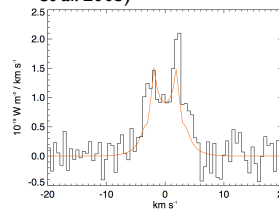


Gas chemistry and line transfer modelling with ProDiMo

[OI] 63, [OI] 145, [CII], and CO 3-2: flat, gas-to-dust ~ 100 disc models produce fluxes within a factor 2 except for [OI] 63.



Comparison modelled CO 3-2 profile with observations (Dent et al. 2005)



Reference:
HD141569, article submitted to A&A
MCFOST: Pinte et al. 2006 A&A 459, 797
ProDiMo: Woitke et al. 2009 A&A 501, 383
Dent et al. 2005 2005, MNRAS, 359, 663
GASPS project: Dent, Thi, Kamp, et al., 2013, PASP, 125, 477
DIANA project: <http://www.diana-project.com/>

• From the PAH image, the inner disc extents to at least 110 AU.

• All models with gas-to-dust mass ratio from 10 to 100 overpredict the [OI] 63 micron flux. The oxygen chemistry may need to be revised.

• A model with gas-to-dust mass ratio of 100 is consistent with all the other gas constraints.

• Disc models with low opening angles (H/r) are favored due to the sensitivity of the [CII] and CO 3-2 flux on the gas density (flat discs are denser).

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Please contact me for more details. I am also looking for a tenure/tenure-track position.